Knowledge management in improving business process: an interpretative framework for successful implementation of AI–CRM–KM system in organizations

Sheshadri Chatterjee and Soumya Kanti Ghosh
Computer Science and Engineering, IIT Kharagpur, Kharagpur, India, and
Ranjan Chaudhuri
Management Studies, NITIE, Mumbai, India

Received 2 May 2019
Revised 17 September 2019
11 December 2019
29 January 2020
Accepted 31 January 2020

Abstract

Purpose – The purpose of this paper is to identify the critical success factors (CSFs) for AI-integrated CRM system for better knowledge management (KM) in organizations to improve business process.
Design/methodology/approach – The factors critical for adoption of AI-integrated CRM system for efficient knowledge management are innumerable. The salient factors may be identified by several means. Methods like brainstorming and Delphi have been applied here. Sixteen CSFs have been identified. Then the interrelationship among these 16 factors, levels of their importance and the principal driving factors have been established by interpretative structural modelling (ISM) methodology.
Findings – The results show that out of 16 CSFs, leadership support, adequate fund and support of functional area leads are the most important CSFs for AI–CRM–KM integration.
Practical implications – The results show that support of top management is essential for successful adoption of AI-integrated CRM system for better knowledge management to improve the business process.
Originality/value – This paper has taken a novel attempt to identify CSFs for AI-integrated CRM adoption for efficient knowledge management system in organizations for improvement of business process and to establish interrelationship among those CSFs with the help of ISM methodology.

Keywords CRM, ISM, Knowledge management, Business process management, AI
Paper type Research paper

1. Introduction

In the context of new environment of business process, the relations between organizations and markets have assumed a new approach (Massingham, 2014). In this context, it has become essential to update the CRM system adopted in an organization (Silva, 2019). Retaining long-term relationship with customers is deemed to be an effective strategic part of CRM system (Venturini *et al.*, 2015). In the context of achieving better competitive advantage, organizations have recognized the importance of integrating CRM system with knowledge management efforts. It would enrich the business process of an organization. Besides, identification of highly valued customers necessitates sophisticated knowledge task (Coleman and Casselman, 2016). This is required for determining and preserving the long-range profile of customers. Work of analysis of customers' profile through human efforts is gradually becoming a tough task (Kargaran *et al.*, 2017) because the volume of the profile is gradually becoming huge. This problem may be addressed by the help of artificial intelligence (AI) (Massis, 2018). Thus, AI-integrated CRM is felt necessary to supplement KM architecture. It would improve the business process of the organizations. Thus, AI-integrated CRM system (intelligent CRM system) would help to support KM environment. Huge data of customers would be analysed by AI and the filtered as well as analysed data of the valued

Business Process Management Journal

1463-7154
DOI 10.1108/BPMJ-05-2019-0183

customers would ameliorate the curated data with the support of KM. This would eventually help the organizations to improve the business by the assistance of intelligent CRM (iCRM) system with appropriate support of KM environment.

Initially, organizations were trying to manage their business-growth activities by CRM system. But it is noted that 70% authorities of organizations concluded that by CRM adoption, they could not perceive any effective and laudable improvement. They felt sad decline in their business performances on the contrary (Kim *et al.*, 2012). Researchers suggested, the organizations should shift their focus from product-oriented view to customer-oriented view (Josiassen *et al.*, 2014) to be relieved from these constraints. Thus, more information of customers are needed to be stored by the organizations to proceed with innovative idea with the help of quick analysis of such data (Hota *et al.*, 2015; Gandomi and Haider, 2015; Kankanhalli *et al.*, 2016). This process consists of analysis of customer data, creation of innovative idea, then implementation to achieve overall business growth (Susha *et al.*, 2015). For analysis of such huge data and for creation of innovative idea, application of iCRM in KM environment is necessary, and to implement this, CRM is required. The data of customers of multifarious nature are analysed through iCRM process in the KM environment (Ranjan and Bhatnagar, 2011). The entire business process chain needs the help of AI integration in CRM–KM system, and we can say it AI–CRM with KM environment (Moreno *et al.*, 2015). Overall success needs AI–CRM with KM environment business process chain integration to achieve success in organizations. To enhance the performance of a business organization towards AI-integrated CRM system with KM environment in the context of improvement of business process, we need to identify the critical success factors (CSFs) and to identify their inter-relationship. By this, the organizations can nurse those CSFs affectionately for achieving their business goals. This paper has taken a sincere attempt to identify the CSFs and their inter-relationships with the help of interpretative structural modelling (ISM) methodology. In this regard, the following research questions (RQs) have been identified, and these are required to be addressed.

RQ1. What are the CSFs for adopting AI-integrated CRM systems for better knowledge management in the organization to improve the business process?

RQ2. How the CSFs are interrelated?

RQ3. Can we develop an interpretative framework to implement AI-integrated CRM system in the KM environment in the organizations?

RQ4. How the CSFs can be classified and categorized as per their levels of importance?

2. Literature review

To achieve different objectives, organizations adopt AI-integrated CRM system for KM. These include improvement of relationship with the valued customers (Coltman *et al.*, 2011; Massingham, 2014). It helps to increase and improve unhindered flow of business process and helps to soften the resistance against introduction of any new process (Payne, 2006; Elbeltagi *et al.*, 2014; Moreno *et al.*, 2015; Chatterjee *et al.*, 2019). It is a common experience that the employees of organizations are found mostly reluctant to accept new ideas and usually do not like any change (Pirkkalainen and Pawlowski, 2014; Moreno *et al.*, 2015). Thus, for achieving success in implementing AI–CRM with KM system, there is need to overcome the resistance contemplated to be offered by the stakeholders of the organizations. This new system supports the organizational authorities to better realise the needs of the customers with proper motivation (Coltman *et al.*, 2011; Susha *et al.*, 2015; Law *et al.*, 2018). By the help of application of AI–CRM with KM environment in organizations, the loyalties of customers are enhanced that would grow trust and intention (Hillebrand *et al.*, 2011; Moreno *et al.*, 2015).

Hence, enhancement of trust is necessary to apply AI–CRM with KM. This would also ameliorate the behavioural intention of the employees to use the new improved system (Bock *et al.*, 2005; Susha, 2015). Trust enhancement may be considered as one of the factors instrumental for successful implementation of AI–CRM system in KM environment.

The overall revenue of the organization is increased (Chen and Chen, 2004; Stone *et al.*, 2017). This business process chain helps to reduce marketing cost along with enhancement of the values of clients (Kim *et al.*, 2012; Mang'unyi *et al.*, 2018). Thus, the applications of AI–CRM with KM are expected to add some value to the business scenario of the organizations (Lau *et al.*, 2016). Business value addition may be considered as one of the success factors towards implementation of AI–CRM with KM. It is important to note that because AI–CRM system in KM environment takes help of information and communication technology (ICT), it is often mistaken by considering this hybrid system as a mere technology, thereby narrowing its overall perspective (Finnegan and Currie, 2010). By such narrow conception of this system, the organizational authorities might face failure to achieve success (Payne and Frow, 2005; Silva, 2019; Abu Ghazaleh *et al.*, 2020). However, in fact, it is not a mere application of software mechanism. Strategically, this iCRM system with KM environment is involved with the business processes, with the people, with the several concerned departments, with front office and with back office of the organizations (Josiassen *et al.*, 2014; Juell-Skielse *et al.*, 2014; Zuiderwijk *et al.*, 2014). Studies highlight that application of AI-integrated CRM system in organizations enhances the competitive advantages of organizations (Shadbolt *et al.*, 2012; Lassinantti *et al.*, 2014). It is a fact; different factors are responsible for effective applications of this system including necessity to train the employees accordingly (Lin *et al.*, 2010; Hillebrand *et al.*, 2011). Thus, adequate training is required to be imparted to the employees, and they are to be kept ready to implement this new hybrid system. Training and readiness may be considered as an important factor for achieving success towards implementation of the AI–CRM with KM (Lin *et al.*, 2010; Silva, 2019). This instrument (AI–CRM with KM) deals with scientific analysis of data, and hence, this work is associated with security and privacy vulnerabilities (Mingers, 2001; Dhillon and Torkzadeh, 2006). Attention of the organizational authorities should be there so that protection of data against its unauthorized use is ensured and appropriate privacy policy is followed for safeguarding the privacy of data (Hota *et al.*, 2015). Adequate security mechanism and privacy policy should be appropriately enforced to safeguard data that would help to successfully implement this new improved system in organizations.

From the studies of the literature, it has become clear that if this hybrid system is applied in an organization with proper plan and strategy, and with proper funding, proper support of management along with structured approach, it would surely derive effective improvement of the business process for achieving success to the organizations (Silva, 2019). Hence, the authorities are required to entice venture capitalists for funding. They are to be assured that by such contribution they would not incur loss (Silva, 2019). Besides, proper and laudable support of manager as well as support of different functional area leads are inevitably necessary for motivating the employees towards use of AI–CRM system in KM environment. Moreover, to handle this new technology, there must be availability of appropriate technical personnel in the organizations along with open and sincere support of the leadership of the organizations to use this new system. This will also help to motivate the employees accordingly (Yu *et al.*, 2010; Yoo *et al.*, 2012; Kargaran *et al.*, 2017). The authority of the organizations contemplating to use this hybrid system should be vigilant for use of the customers' data legally and to take appropriate legal actions as and when infringement of data privacy takes place. Support of legal requirements is necessary (Josiassen *et al.*, 2014). Besides, the tools for implementing this system should be developed and designed with simplicity and without any flaw so that the stakeholders can use this system with ease (Payne, 2006; Fullwood *et al.*, 2013; Sadbolt *et al.*, 2012; Kim *et al.*, 2012).

Be it mentioned here that the relationships among different success factors are to be assessed by application of appropriate methodology. For this, interpretative structural modelling methodology is perceived to be effective (Attri *et al.*, 2013). This will help to develop a comprehensive framework for implementing AI-integrated CRM system in KM environment as well as it will help to categorize the level of importance of each and every critical success factor so identified (Warfield, 1974; Sage, 1977). In this way, this literature review section has been able to support for addressing the research questions. Hence, there is need of identification of CSFs for successful implementation of AI–CRM–KM system in organizations.

3. Research design and identification of success factors

Factors for successful application of this hybrid system have been identified with the grounded theory (Orbin and Strauss, 1990). With the help of in-depth interview by the process of brainstorming and Delphi methodology (Rowe and Wright, 1999; Skulmoski *et al.*, 2007) involving opinion of experts, initially we strived to realize the development status towards adoption of AI–CRM–KM System and identified the success factors. So far as consultation stage of experts is concerned, we contacted six experts for obtaining their opinion. All the experts have in-depth understanding of organizational business process (Lau *et al.*, 2016). They all are well-educated, working in industries with appropriate knowledge. Each of these six experts has more than five years of experience in the domain of our study. With the help of these experts (Depth interview) and with the knowledge of existing literature in this context, we have been able to identify 18 success factors related to adoption of AI–CRM–KM system. These are shown in Table I. Now, for identification of CSFs from these 18 success factors, feedbacks of some respondents were taken against some questions. The questionnaire was in the form of statements, and there were five options where each respondent had to put one tick mark. The options were strongly disagree (SD) with mark 1, disagree (*D*) with mark 2, neither agree nor disagree (NAND) with mark 3, agree (*A*) with mark 4 and strongly agree (SA) with mark 5. The respondents are mostly the employees of different organizations selected randomly from Mumbai, Bengaluru and Delhi (three metropolitan cities of India), holding different posts. Some research scholars of different universities from these metropolitan cities were chosen at random as respondents. The questionnaire (set of questions) has been prepared in the usual way of scale development architecture (Carpenter *et al.*, 2016) through step-by-step approach (Carpenter, 2018). This step-by-step approach mainly contains seeking opinion of experts, pretest and so on. Focus has been emphasized so that there should not be any leading and controversial question. These questions were framed free from defects of readability constraints.

As already stated, we have conducted "pretest" to improve the quality of the questionnaire. For this, some researchers, other than those already consulted, were requested to scrutinize the scale (DeVellis, 2012) for assessing the content validity by evaluating the prepared items for redundancy and gaps. Apart from conducting pretest, a pilot study was also conducted to enhance the clarity, readabilities as well as face validity of the items. For conducting pilot study, some employees of befitting organizations, other than those already consulted, were requested to study the filtered set of questions to ascertain if there is any indistinctness in the structure of the questions. Some of the items eventually had to be dropped, and as suggested by them, some laudable effective items were added after making them verified by the six experts. In this way, the set of questions in the form of statements were finally prepared and were put to the useable respondents for obtaining their feedbacks towards quantification through 5-point Likert Scale as already mentioned.

On receipt of the feedbacks, these were quantified. The descriptive statistical analysis of each success factor has been obtained through statistical approach by the help of SPSS.

Factors	Meaning with references
Overcoming resistance to change	Impediment to new idea or system Pirkkalainen and Pawlowski (2014); Moreno *et al.* (2015)
Business value addition	Perceived worth of adoption of AI–CRM–KM system Lau *et al.* (2016)
Adequate security mechanism	Protecting data from unauthorized users. Dhillon and Torkzadeh, (2006)
Develop privacy policy	To keep the sensitive information confidential for the new AI–CRM–KM system Hota *et al.*, (2015)
Supporting legal requirements	To use the data of information of customers legally and to act as and when breaches take place Josiassen *et al.* (2014)
Contribution of venture capitalists	Venture capitalists contribute for the development of high-tech industries, and they invest in such industries that are expected not to incur any loss, ensuring return on investment to them Silva (2019)
Behavioural intention of the employees using new AI–CRM–KM system	Motivation of the employees for smoothly adopting the new AI–CRM–KM system Susha *et al.* (2015); Bock *et al.* (2005)
Ease of use	The system is to be used by the employees without complexity that would pull more employees to use the new AI–CRM–KM system spontaneously Tan and Noor (2013); Lau *et al.* (2016)
Enhancement of trust	The users and stakeholders should possess trust to use the new AI–CRM–KM tool Hillebrand *et al.* (2011)
Design and development of AI–CRM tool for better KM	The AI-integrated CRM tool for KM should be designed and developed scientifically, having no flaw at all Payne (2006); Fullwood *et al.* (2013)
Adequate training and readiness for KM	The users should be sufficiently trained so that they can use it easily, and they should be always kept ready to reconcile any unforeseen eventualities (Lin *et al.* (2010); Silva (2019)
Adequate fund allocation	Proper funding to be made. The adoption should not be hindered for paucity of fund Silva (2019)
Immediate Manager's Support	Immediate manager should extend his whole-hearted support for successful adoption of AI–CRM–KM system Silva (2019)
High-tech technical personnel	High-tech technical personnel possessing high technical competence play a pivotal role in promoting the adoption of AI–CRM–KM tool in organizations Yu *et al.* (2010)
Support of functioned area lead	The immediate functional area lead should unhesitatingly support the system for its success Silva (2019)
Leadership support welcoming AI–CRM–KM integration	Unless the leaders extend their support to the users to use the new system, success will not come Yoo *et al.* (2012); Kargaran *et al.* (2017)
Simplicity to use the new AI–CRM–KM system and ease of use	The tool should be simple and easy to use Shadbolt *et al.* (2012); Kim *et al.* (2012)
Driving adoption of AI–CRM–KM system in the organizations	The overall action and process to effectively adopt the new AI–CRM–KM system in the organization Zack *et al.* (2009)

Table I.
Brief description/ meaning of factors identified with source

This is shown in Table II. The first 16 success factors with highest mean values have been chosen as CSFs. The inter-relationship among these 16 CSFs has been determined with the help of ISM. Eventually, a conclusion has been drawn. The flowchart is shown in Figure 1.

From the procedure shown in Figure 1 and from the literature review, it has become clear that a comprehensive identification of the salient factors related to adoption of AI–CRM–KM System in organizations has not been previously undertaken in a planned way. Hence, through the process of brainstorming (Osborn, 1953) and Delphi methodology (Dalkey and Helmer, 1963; Rowe and Wright, 1999; Hasson *et al.*, 2000; Skulmoski *et al.*, 2007), the CSFs

Critical factors	Eigen values	Variance (%)	Factor loading	Mean	SD	Median
Adequate security mechanism	5.24	12.12	0.818	3.62	0.74	4
Develop privacy policy	6.31	11.46	0.813	4.01	0.82	4
Overcoming resistance to change	5.42	7.01	0.921	3.32	0.91	3
Supporting legal requirements	3.96	8.21	0.761	3.256	0.815	3
Ease of use	3.113	6.66	0.799	3.84	0.912	4
Enhancement of trust	4.214	5.75	0.801	4.452	1.017	4
Design and development	1.765	6.43	0.903	4.156	0.824	4
Support of functional area lead	1.821	7.76	0.941	3.728	0.813	4
Behavioural intention of the employees using AI–CRM–KM system	3.023	8.82	0.911	3.542	0.89	3
Driving adoption of new AI–CRM–KM tool	1.172	4.13	0.872	3.61	1.012	4
Adequate training and readiness for better KM	1.132	2.46	0.792	4.023	0.87	3
Adequate fund allocation	1.414	2.13	0.745	3.72	0.89	3
Immediate manager's support	1.52	3.33	0.921	3.481	0.845	3
Leadership support welcoming AI–CRM–KM integration	1.211	2.46	0.943	3.112	1.011	4
Simplicity to use the new KM system	1.01	4.12	0.956	3.96	0.861	4
Business value addition	1.03	2.79	0.897	4.012	0.871	4
Contribution of venture capitalists	1.002	2.07	0.628	2.081	0.611	3
High-tech technical personnel	1.006	2.10	0.422	2.102	0.626	2

Table II.
Different parameters of CSFs

instrumental to improve adoption of AI–CRM–KM system in organizations have been identified. The stepwise process for identification of CSFs has already been discussed. The CSFs which were finally identified are 16 in number. These are the following: leadership support, adequate funding, support of functioned area lead, proper design and development of the tool, training and readiness of stakeholders, immediate manager's support, security, privacy, enforcement of legal requirements, business value addition, enhancement of trust, simplicity of new AI–CRM–KM system, behavioural intention of employees to use this tool, ease of use, overcoming impediment and adoption of AI–CRM–KM system. The aim of this study is to ensure effective "adoption of AI-CRM-KM System" in organizations. Hence, this is considered as the goal, and all other important 15 factors are supposed to have explored surrounding it. Table I highlights the meaning of all these factors in a brief way.

Different parameters like Eigen values, variance (per cent), factor loadings, mean, standard division (SD) and median have been computed, and the results are shown in Table II.

4. Research methodology: the interpretative structural modelling (ISM)

This method is a popular method. It helps to identify specific relationship among the specific factors. It can easily define a critical problem or an issue (Jharkharia and Shankar, 2005). There are many cases where it is found that a few issues are inter-related to a complex problem which is under consideration. However, the situation can be understood more specifically and accurately by realizing the direct and indirect relationship among the factors. It will serve better compared to that can be obtained when each factor is considered separately. Hence, it can be safely said that this ISM methodology can help develop an effective insight towards collective understanding of these complex relationships (Attri *et al.*, 2013). This method is called an interpretive method. In this method, an overall structure is

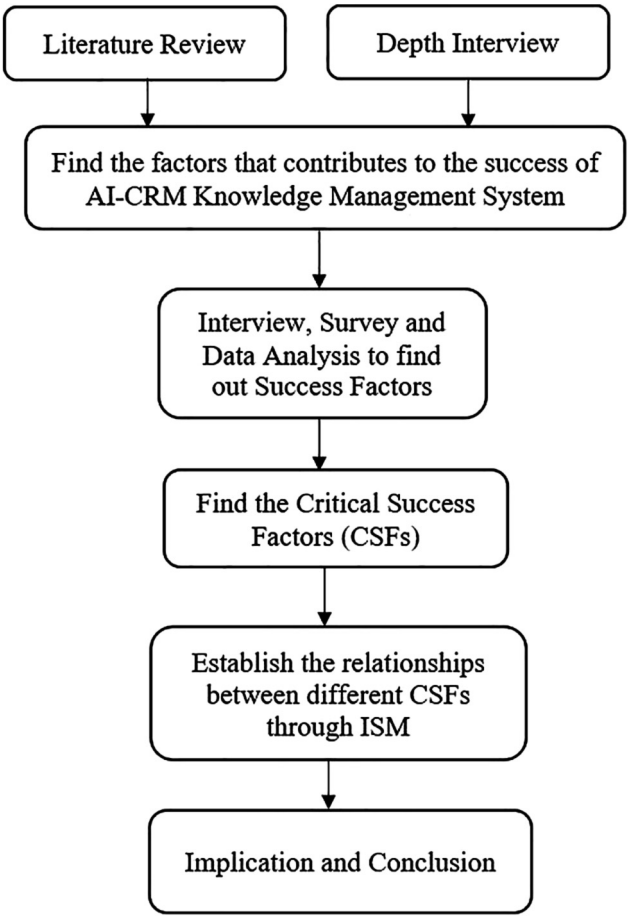

Figure 1.
Research framework for this study

found from the set of variables which are otherwise complex. This can be done by understanding their inter-relationships. Eventually, the overall structure is presented in a digraph modelling by the help of a hierarchical arrangement. The complex relationship among some variables is made easy through application of ISM (Warfield, 1974; Sage, 1977). This ISM methodology has found its successful applications in many areas like linking competitive factors to analyse strategic decisions relating to small and medium enterprises (Singh *et al.*, 2007). It has found its effective use in supply chain management (Agarwal *et al.*, 2007). It has been successfully applied in analysing interactions among the barriers relating to total quality management issues (Taleb, 2011). In this way, it is seen that analysis through ISM methodology gives clear picture showing specific relation among the factors.

In this article, through brainstorming, through Delphi methodology and through studies of different parameters of success factors (Table II), we have been able to identify 16 CSFs instrumental towards adoption of AI–CRM–KM tool in organizations. Now, we shall apply ISM methodology to establish the relations among these critical factors. We shall try to represent an overall structure in a digraph modelling with the help of hierarchical arrangement. In brief, this approach helps to simplify a complex problem. It can provide

explanation of the embedded object. It helps to reply "what" and "how" in theory building. It helps to identify the structure within a system.

4.1 Identifying structural relationship among CSFs using ISM methodology

By the help of ISM methodology, attempt is being made here to draw a structural relationship among the 16 identified CSFs. This methodology comprises the below-mentioned sequence of events.

(1) To construct the Structural Self Interaction Matrix (SSIM)

(2) To construct the Reachability Matrix (RM)

(3) To carry out the process of level partitioning

(4) To cluster the factors so identified

(5) To form the ISM model

4.1.1 Construction of Structural Self-Interaction Matrix (SSIM). The CSFs have already been determined by the help of opinion from experts through the process of brainstorming and Delphi methodology and through studies of different parameters of all the success factors (Table II). Now, it is necessary to assess the contextual relationship among the factors for developing the SSIM. Here, the relationship concerning "this leads to that" is chosen. For this, four symbols have been used to denote the directions of relationships between the parameters i and j (here $i < j$).

Here V, A, X, O notations are used to describe each different (i, j) pair. Here, the notations denote as follows:

V - Construct i helps to achieve j
A - Construct j influences i
X - Parameter i and j lead to both
O - The parameters i and j are not related

With the help of this contextual relationship, the SSIM is constructed and is shown in Table III.

4.1.2 Constructions of reachability matrix (RM). The SSIM has been converted into a binary matrix. This is called initial reachability matrix. It has been achieved by substituting V, A, X and O with 1 and 0 as the case may be. To substitute 1s and 0 s, the following rules have been adhered to.

Matrix Rule
• If (i, j) pair in the SSIM is V, then (i, j) in RM is considered as 1 and (j, i) becomes 0.
• If (i, j) pair in the SSIM is A, then (i, j) in RM is considered as 0 and (j, i) is considered 1.
• If (i, j) pair in the SSIM is X, then (i, j) in RM is taken as 1 and (j, i) pair is also considered as 1.
• If the (i, j) entry in the SSIM is O, then (i, j) in RM is considered as 0 and (j, i) pair is also considered 0.

Adhering to this rule, the initial Reachability Matrix (RM), for successful implementation of AI–CRM–KM system in organizations, is shown in Table IV.

4.1.3 Carrying out level partitioning. Reachability sets and antecedent sets are assessed for each critical success factor from the inputs of final reachability matrix. For easy conceptualization it is to state as:

Let R (Si) = Reachability set for variable Si. It is defined as set of variables concerning to the columns which contained 1 in row Si.

Sl. No.	Critical Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Leadership Support welcoming AI-CRM-KM Integration		V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
2.	Adequate fund allocation	V		O	V	V	O	V	V	V	O	V	O	V	O	V	V
3.	Support of functional area lead	V	O		O	V	V	O	O	V	V	V	V	V	V	V	V
4.	Design and Develop AI-CRM-KM tool	V	V	O		O	O	V	V	V	O	V	O	V	O	V	V
5.	Adequate Training and Readiness	V	V	V	O		O	O	O	V	O	V	O	V	O	V	V
6.	Support of Immediate Manager	V	O	V	O	O		O	O	O	V	O	V	V	V	V	V
7.	Adequate Security Mechanism	V	V	O	V	O	O		X	O	O	V	O	V	O	V	V
8.	Develop Privacy Policy for AI-CRM-KM Integration	V	V	O	V	O	O	X		O	O	V	O	V	O	V	V
9.	Supporting Legal Requirements	V	V	V	V	V	O	O	O		O	V	O	V	O	V	V
10.	Business Value Addition	V	O	V	O	O	V	O	O	O		O	V	V	V	V	V
11.	Enhance Trust towards using new AI-CRM-KM System	V	V	V	V	V	O	V	V	V	O		O	V	O	V	V
12.	Simplicity of the new AI-CRM-KM System	V	O	V	O	O	V	O	O	O	V	O		V	V	V	V
13.	Behavioral Intension of the employees using new AI-CRM-KM System	V	V	V	V	V	V	V	V	V	V	V	V		A	V	V
14.	Ease of Use (the new AI-CRM-KM System)	V	O	V	O	O	V	O	O	O	V	O	V	A		V	V
15.	Overcoming Resistance to Change (from legacy CRM to AI-CRM-KM System)	V	V	V	V	V	V	V	V	V	V	V	V	V	V		V
16.	Driving Adoption of AI-CRM-KM System in the Organization	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	

Table III.
Structural self-interaction matrix

Let A (Si) = Antecedent set for variable Si. It is defined as set of variables concerning to the rows that contain 1 in the column Si.

Once these are found out, the intersections of these sets R(Si) and A(Si) are derived concerning to all the factors. The levels associated with different factors are also identified. The concerned factors for which the R (Si) [reachability set] and A (Si) [antecedent set] are the same would occupy the top level in the hierarchy of ISM. After the identification of top-level factor, it is removed from further consideration. Same process is repeated to identify the factors for the next level, and this process is repeated through step-to-step iteration processes. This iteration process is continued until we could find out level of each factor. These levels eventually help to build the digraph and the final model (Agarwal *et al.*, 2007; Singh *et al.*, 2007). In this article, the process has been completed in eight iterations as shown in Appendix.

4.2 Cluster analysis of factors and related IS model

The 16 CSFs already described are compartmentalized into 4 clusters. This is shown in Figure 2. The clusters are shown in dependence and driving power matrix. It is also known as MICMAC analysis. This matrix performs a structural analysis to identify any indirect relationship among the factors. In this matrix, all the factors are classified into four clusters as autonomous, dependent, linkage and driver. The following is a brief description of all the four clusters and their importance and linkages.

Cluster I. This cluster is also known as "Autonomous Factors". These are weak factors both in terms of driver and dependent factors. They are mostly not connected directly with the system, and they do not have direct influence on the other factors so identified.

Cluster II. This cluster is also known as "Dependent Factors". These factors are having weak driving capability but are having strong dependent. These factors also depend on the other factors so identified in this study.

Sl.No	Critical factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Driving power
*F*1	Leadership support welcoming AI–CRM–KM integration	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	*16*
*F*2	Adequate fund allocation	0	1	0	1	1	0	1	1	1	0	1	0	1	0	1	1	*10*
*F*3	Support of functional area lead	0	0	1	0	1	1	0	0	1	1	1	1	1	1	1	1	*11*
*F*4	Design and develop AI–CRM–KM tool	0	0	0	1	0	0	1	1	1	0	1	0	1	0	1	1	*8*
*F*5	Adequate training and readiness	0	0	0	0	1	0	0	0	1	0	1	0	1	0	1	1	*6*
*F*6	Support of immediate manager	0	0	0	0	0	1	0	0	0	1	0	1	1	1	1	1	*7*
*F*7	Adequate security mechanism	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1	1	*6*
*F*8	Develop privacy policy for AI–CRM–KM system	0	0	0	0	0	0	1	1	0	0	1	0	1	0	1	1	*6*
*F*9	Supporting legal requirements	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	1	*5*
*F*10	Business value addition	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	*6*
*F*11	Enhance trust towards using new AI–CRM–KM system	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	*4*
*F*12	Simplicity of the new AI–CRM–KM system	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	*5*
*F*13	Behavioural intention of the employees using AI–CRM–KM System	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	*3*
*F*14	Ease of use (the new AI–CRM–KM System)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	*4*
*F*15	Overcoming resistance to change (from legacy CRM to AI–CRM–KM)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	*2*
*F*16	Driving adoption of AI- integrated CRM–KM system in the organization	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	*1*
	Dependence	*1*	*2*	*2*	*3*	*4*	*3*	*5*	*5*	*6*	*4*	*9*	*5*	*14*	*6*	*15*	*16*	

Table IV.
Reachability matrix

Cluster III. This cluster is also known as “Linkage”. These factors are strong drivers as well as they have strong dependent power. These factors are not stable but influence of these factors can impact the other factors in the system.

Cluster IV. The fourth cluster is also known as “Drivers” or “Independent”. These factors are strong drivers but weak dependent. These are also called independent factors.

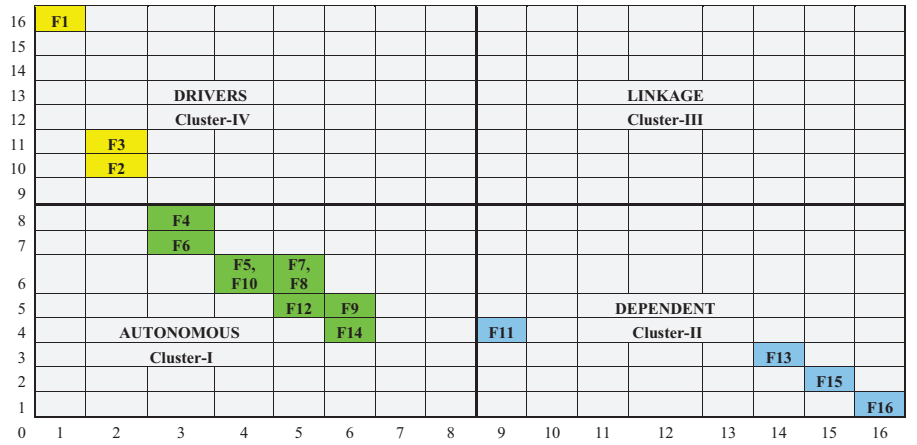

Figure 2.
Dependence and driving power diagram

The following MICMAC analysis shows all these four clusters with all the identified critical success factors mapped in the matrix.

{*F*1, *F*2, *F*3} → Drivers (Shown in Yellow colour)
{*F*4, *F*6, *F*5, *F*10, *F*7, *F*8, *F*12, *F*9, *F*14} → Autonomous (Shown in Green colour)
{*F*11, *F*13, *F*15, *F*16} → Dependent (shown in blue colour)

4.2.1 The IS model and clustering. The following Figure 3 shows the interpretative structural (IS) model having three cluster regions which are, dependent cluster, autonomous cluster and driver cluster. Three colour codings have been used to distinguish among them. Dependent cluster factors are shown in blue whereas the autonomous and driver cluster factors are shown in green and yellow colours, respectively. The first cluster includes autonomous factors. They possess weak driving power with weak dependence. These factors are comparatively disconnected or weakly connected with the system. The second cluster consists of "dependent factors". These factors relatively possess weak driving power but have relatively strong dependence. The third cluster contains the linkage variables. They possess strong driving power with stronger dependence. Actions on these variables (in the third cluster) have appreciable effect on those variables. A feedback effect is also perceived on the factors of third cluster. Finally, the fourth cluster consists of "independent factors". They possess strong driving power with weak dependence. Here, in this study, we do not have linkages. As we have mentioned, the IS Model is shown in Figure 3.

5. Findings of the study

The results of this study can be analysed mainly from the "Dependence and driving power diagram" (Figure 1). This diagram helps to realise the relative importance of each of the factors with a quantitative character.

There are nine factors in the first cluster (autonomous factors). They are *F*4, *F*6, *F*5, *F*10, *F*7, *F*8, *F*12, *F*9 and *F*14 which are "Design and Develop AI-CRM-KM tool", "Support of Immediate Manager", "Adequate Training and Readiness", "Business Value addition", "Adequate Security, Mechanism", Develop Privacy Policy for AI-CRM-KM', "Simplicity of new AI-CRM-KM system", "Supporting Legal Requirements", and "ease of Use" (the new AI-CRM-KM System) respectively. Results show that the impacts of these factors are limited. The connections of these 9 factors are limited to the system. Hence, to ensure the effective adoption of AI-integrated CRM–KM system, special attention is to be focussed on these nine factors.

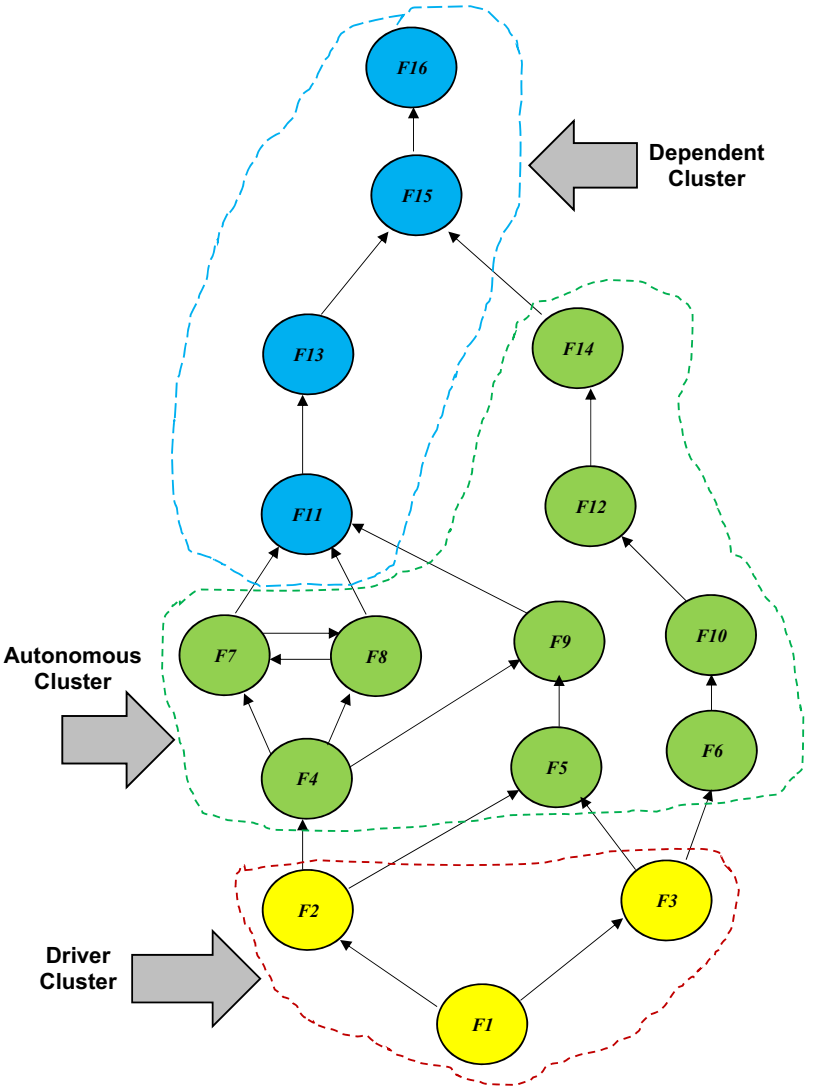

Figure 3.
Is model: Dependent, autonomous and driver clusters

In the second cluster (dependent) there are four factors. They are *F*11, *F*13, *F*15 and *F*16 which are "Enhance trust towards using new AI-CRM-KM System", "Behavioural Intention of the employees using AI-CRM-KM System", "Overcoming Resistance to Change (from legacy CRM to AI-CRM-KM)", and "Driving Adoption of AI-integrated CRM-KM System in the Organization" respectively. These four factors are considered as weakest drivers. However, they have strong dependence on other factors. These factors are considered as the desired goals which are instrumental in the context of effective adoption of AI-integrated CRM–KM system in organizations that would improve the overall business process of the organizations.

In the third cluster (linkages), there is no factor in our study. Because no linkage factor is there in our study, no further discussion is done here. All these have been summarized in Figure 4. The autonomous cluster (Figure 3) contains nine factors like *F*4, *F*5, *F*6, *F*7, *F*8, *F*9, *F*10, *F*12 and *F*14. They are not correlated closely because they are autonomous. Hence, it is not expected that by improving some of these factors, other factors in this cluster will automatically be improved. Focus is to be given to improve each of the factors in this cluster. Besides, Figure 3 highlights that in "Driver Cluster", there are three factors *F*1, *F*2 and *F*3 which are leadership support, adequate fund allocation, support of functional area lead, respectively. These three factors are considered as strong drivers for achieving AI–CRM with KM system in organizations. The scenario has been clarified through MICMAC analysis vide Figure 2. The authorities need to focus special attention on these factors to strengthen them separately. If they are made robust and strong, other factors will also be strengthened as these three factors drive the entire structure as is evident from Figure 4. These three factors act as plinth of this entire structure (Level 8 and Level 7 in Figure 4). If they are made strong, the other factors will be automatically improved and the goal (Level 1 in Figure 4) of the organization will be achieved successfully".

It is to be noted that this business process chain consisting of AI-integrated CRM–KM system would help to enrich the KM efficiency to fetch better result in the organization. By such application of the integrated system (AI–CRM–KM), the efficiency of the business process is expected to be improved. Revitalization of the KM system with such integrated approach would show a transparent road map to the organization for effectively and meaningfully augmenting their business process which is expected to fetch overall success to the organizations eventually.

In the fourth cluster (drivers), there are three factors. They are *F*1, *F*3 and *F*2 which are "Leadership Support Welcoming AI-CRM-KM Integration", "Support of Functional Area Lead" and "Adequate Fund Allocation" respectively. These three factors are drivers. They are situated at the bottom of the model. Here in level 8 and in level 7, they are situated. They are considered as independent factors. The goal may be successfully achieved by continuously nurturing upon these three drivers.

6. Critical contribution

The issue of application of AI-integrated CRM system for KM in organizations is a relatively new idea. It is an emerging field of research. Few research studies have been published in this context. So far as the authors' knowledge goes, there has been hardly any attempt to detect success factors for adoption of AI-enabled CRM system for better KM to improve business process in the organizations. Organizations have developed their process of business development by CRM with the help of AI. But analysis of complex behaviour of customers led the organizations to create some idea and mechanism to retain and capture customers. This requires KM in a most efficient way. Hence, the process chain AI–CRM–KM for the organizations would bring in success. Inclusion of AI in CRM–KM system is claimed to be a critical contribution of this study. In this light, this study is considered as a unique study. This study has identified and linked sixteen critical success factors concerning to adoption of AI-integrated CRM system for efficient KM in organizations for improving business process. The formal and meaningful development of these relations among the factors associated with identification of further predictive causal links among the factors are an effective contribution in this research study. Utilisation of ISM methodology helps us to identify the inter-relations among the critical success factors along with identification of driving force responsible for successful adoption of AI-integrated CRM for better KM in organization. This is also considered as a key theoretical contribution of this research study. The hierarchy of factors provided in the model highlights the comparative weightage of different factors as

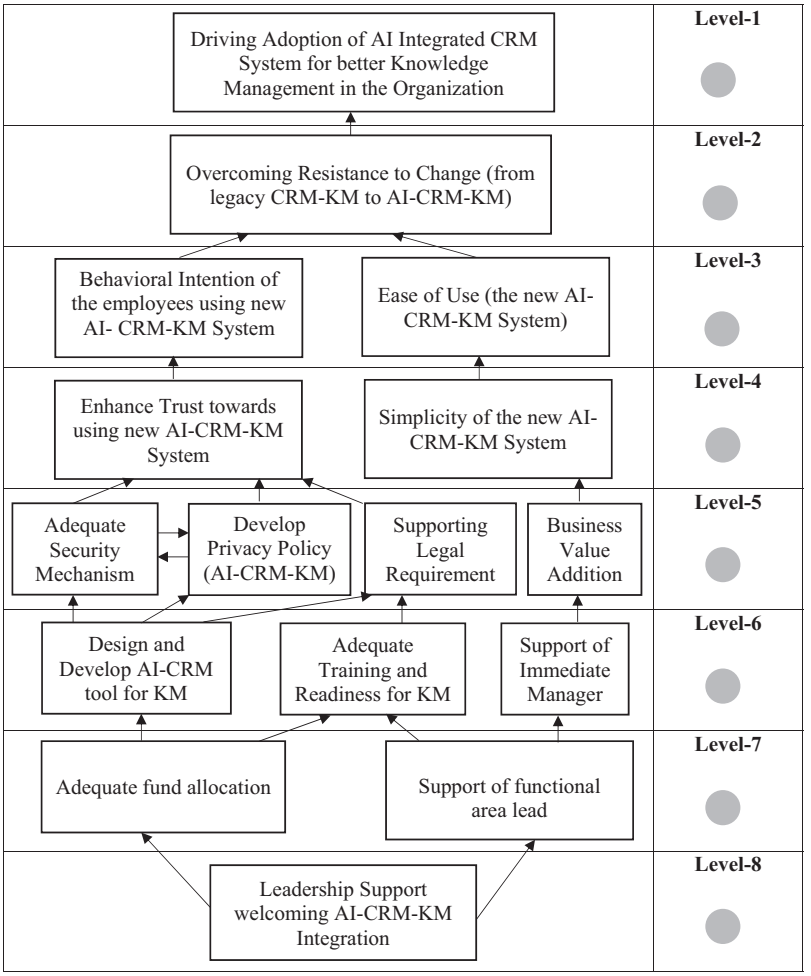

Figure 4.
Interpretative structural modelling with CSFs

drivers. The constructs capturing in the same level in the ISM model gives an idea how they are intimately related with each other. These results would help the researchers to select these CSFs for further research in this area. This would also help the researchers for an accurate validation of the model.

7. Practical implication

Identification of CSFs impacting adoption of AI-integrated CRM system for efficient KM in organizations has been obtained from the ISM-based proposed model that has established their inter-relationships. This provides a comprehensive framework to the policy makers and practitioners for managing as well as for encouraging adoption of AI-integrated CRM system for better KM in organizations. By the help of ISM methodology, it has become possible to impose direction and order in the complications associated with the relationships among the factors influencing adoption of AI–CRM–KM system in organization. This is expected to help the policy makers for using available resources instrumental for enhancing adoption rate of

AI-integrated CRM system for better KM in organizations. It would improve overall business process to ensure better business benefits to the organizations. The dependence and driving power diagram (Figure 3) in this study highlights that the success of adoption would be fully achieved if leadership support welcoming AI–CRM–KM Integration (*F*1) is ensured and placement of fund (*F*2) and support of functional area lead (*F*3) are obtained. The policy makers are to be sincere in this respect.

8. Conclusion

We have already mentioned earlier that there are only few outputs from the literature study that helped to identify the CSFs concerning to adoption of AI-integrated CRM system for efficient KM in organizations. However, from the panel of experts channelizing through the process of brainstorming and Delphi methodology and through studies of different parameters of success factors (Table II), 16 factors relevant to influence adoption of AI–CRM system in KM environment in organizations have been identified. The categorization of the factors has been achieved. Inter-relationships among these 16 critical success factors could be established with the help of ISM methodology. The results highlight that support of leadership, adequate fund allocation and support of functional area lead form the foundation for adoption of AI-integrated CRM systems for efficient KM system in organizations. The study presented in this article is expected to extend help to the concerned managers of the organizations adopting AI–CRM system in KM environment to identify the exact areas. On these areas, the leaders are needed to focus their sincere attention for improving the adoption rate of AI–CRM–KM system. It is a fact that the concerned authorities of organizations adopting AI-integrated CRM system for efficient KM to improve their business health need to know various CSFs. But because a systematic approach is needed for identification of CSFs and because the factors might have complex relationships among them, it is essential that such type of comprehensive approach is in place. Again, the hierarchy-oriented ISM defines explicitly those constructs which are critical and which demand special attention for achieving success. This approach has provided ample scope to arrive at a strategic decision for effective formulation of the policy for the concerned organizations. The proposed ISM model acts as an effective and comprehensive guideline for improving the performances with application of AI–CRM system to support KM environment. Practically, by the help of AI, huge volume of data (big data) of customers is analysed for CRM system management within the KM environment. This study has focused on analysis of customers' data through the help of KM in which AI-integrated CRM system is being implemented. This study concludes the following.

(1) This study has been able to identify the CSFs for adoption of AI-integrated CRM system for efficient KM system in the organizations.

(2) This study has been able to establish the relationship among the 16 identified CSFs.

(3) It has been able to propose a comprehensive structural model of CSFs for successful implementation of AI–CRM–KM system in organizations for improving the business process.

(4) It could effectively classify the identified CSFs into various categories. These are essential for successful implementation of AI–CRM-integrated KM system in organizations.

In brief, the results highlight that appropriate emphasis is to be given on having support of leadership, as well as having appropriate support from the concerned functional area head. This would help to reach the goal provided the organization must not feel constraint towards having adequate fund support.

9. Limitations of the study

The limitations of this study are many folds. The increase of number of factors enhances the complexity of ISM approach. Hence, this approach is appropriate when CSFs are limited in number. Here, experts' help is taken in synthesizing the driving force as well as dependence power of the factors involved in the problem. This approach has no scope to be statistically validated. The approach is silent on the causality of links. Hence, it possesses limitations in answering "why" in matters to theory building. The link interpretation is partial and as such, it is open to multiple interpretations by the users.

References

Abu Ghazaleh, M. and Zabadi, A. (2020), "Promoting a revamped CRM through internet of things and big data: an AHP-based evaluation", *International Journal of Organizational Analysis*, Vol. 28 No. 1, pp. 66-91.

Agarwal, A., Shankar, R. and Tiwari, M.K. (2007), "Modeling agility of supply chain", *Industrial Marketing Management*, Vol. 36 No. 4, pp. 443-457.

Attri, R., Dev, N. and Sharma, V. (2013), "Interpretive structural modelling (ISM) approach: an overview", *Research Journal of Management Science*, Vol. 2 No. 2, pp. 3-8.

Bock, G., Zmud, R., Kim, Y. and Lee, J. (2005), "Behavioral intention formation in knowledge sharing: examining the roles of extrinsic motivators, social-psychological forces, and organizational climate", *MIS Quarterly*, Vol. 29 No. 1, pp. 87-111.

Carpenter, S. (2018), "Ten steps in scale development and reporting: a guide for researchers", *Communication Methods and Measures*, Vol. 12 No. 1, pp. 25-44.

Carpenter, S., Grant, A.E. and Hoag, A. (2016), "Journalism degree motivations (JDM): the development of a scale", *Journalism and Mass Communication Educator*, Vol. 71 No. 1, pp. 5-27.

Chatterjee, S., Ghosh, S., Chaudhuri, R. and Nguyen, B. (2019), "Are CRM systems ready for AI integration? A conceptual framework of organizational readiness for effective AI-CRM integration", *The Bottom Line*, Vol. 32 No. 2, pp. 144-157.

Chen, Q. and Chen, H. (2004), "Exploring the success factors of eCRM strategies in practice", *Journal of Database Marketing and Customer Strategy Management*, Vol. 11 No. 4, pp. 333-343.

Coleman, L. and Casselman, R.M. (2016), "Optimizing decisions using knowledge risk strategy", *Journal of Knowledge Management*, Vol. 20 No. 5, pp. 936-958.

Coltman, T., Devinney, T.M. and Midgley, D.F. (2011), "Customer relationship management and firm performance", *Journal of Information Technology*, Vol. 26 No. 3, pp. 205-219.

Dalkey, N. and Helmer, O. (1963), "An experimental application of the Delphi method to the use of experts", *Management Science*, Vol. 9 No. 3, pp. 458-467.

DeVellis, R.F. (2012), *Scale Development. Theory and Applications*, 3rd ed., Sage, Thousand Oaks, CA.

Dhillon, G. and Torkzadeh, G. (2006), "Value focused assessment of IS Security", *Information Systems Journal*, Vol. 16 No. 3, pp. 293-314.

Elbeltagi, I., Kempen, T. and Garcia, E. (2014), "Pareto-principle application in non-IT supported CRM processes: a case study of a Dutch manufacturing SME", *Business Process Management Journal*, Vol. 20 No. 1, pp. 129-150.

Finnegan, D. and Currie, W. (2010), "A multi-layered approach to CRM implementation: an integration perspective", *European Management Journal*, Vol. 28 No. 2, pp. 153-167.

Fullwood, R., Rowley, J. and Delbridge, R. (2013), "Knowledge sharing amongst academics in UK universities", *Journal of Knowledge Management*, Vol. 17 No. 1, pp. 123-136.

Gandomi, A. and Haider, M. (2015), "Beyond the hype: big data concepts, methods, and analytics", *International Journal of Information Management*, Vol. 35 No. 2, pp. 137-144.

Hasson, F., Keeney, S. and McKenna, H. (2000), "Research guidelines for the Delphi survey technique", *Journal of Advanced Nursing*, Vol. 32 No. 4, pp. 1008-1015.

Hillebrand, B., Nijholt, J. and Nijssen, E. (2011), "Exploring CRM effectiveness: an institutional theory perspective", *Journal of the Academy of Marketing Science*, Vol. 39 No. 4, pp. 592-608.

Hota, C., Upadhyaya, S. and Al-Karaki, J.N. (2015), "Advances in secure knowledge management in the big data era", *Information Systems Frontiers*, Vol. 17 No. 5, pp. 983-986.

Jharkharia, S. and Shankar, R. (2005), "IT-enablement of supply chains: understanding the barriers", *Journal of Enterprise Information Management*, Vol. 18 No. 1, pp. 11-27.

Josiassen, A., Assaf, A.G. and Cvelbar, L.K. (2014), "CRM and the bottom line: do all CRM dimensions affect firm performance?", *International Journal of Hospitality Management*, Vol. 36, pp. 130-136.

Juell-Skielse, G., Hjalmarsson, A., Juell-Skielse, E., Johannesson, P. and Rudmark, D. (2014), "Contests as innovation intermediaries in open data markets", *Information Polity*, Vol. 19 Nos 3-4, pp. 247-262.

Kankanhalli, A., Hahn, J., Tan, S. and Gao, G. (2016), "Big data and analytics in healthcare: introduction to the special section", *Information Systems Frontiers,* Vol. 18 No. 2, pp. 233-235.

Kargaran, S., Pour, M.J. and Moeini, H. (2017), "Successful customer knowledge management implementation through social media capabilities", *VINE Journal of Information and Knowledge Management Systems*, Vol. 47 No. 3, pp. 353-371.

Kim, M., Park, J., Dubinsky, A. and Chaiy, S. (2012), "Frequency of CRM implementation activities: a customer-centric view", *Journal of Services Marketing*, Vol. 26 No. 2, pp. 83-93.

Lassinantti, J., Bergvall-Kåreborn, B. and Ståhlbröst, A. (2014), "Shaping local open data initiatives: politics and implications", *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 9 No. 2, pp. 17-33.

Lau, H., Nakandala, D., Samaranayake, P. and Shum, P.K. (2016), "BPM for supporting customer relationship and profit decision", *Business Process Management Journal*, Vol. 22 No. 1, pp. 231-255.

Law, R., Fong, D., Chan, I. and Fong, L. (2018), "Systematic review of hospitality CRM research", *International Journal of Contemporary Hospitality Management*, Vol. 30 No. 3, pp. 1686-1704.

Lin, R., Chen, R. and Chiu, K. (2010), "Customer relationship management and innovation capability: an empirical study", *Industrial Management and Data Systems*, Vol. 110 No. 1, pp. 111-133.

Mang'unyi, E., Khabala, O. and Govender, K. (2018), "Bank customer loyalty and satisfaction: the influence of virtual e-CRM", *African Journal of Economic and Management Studies*, Vol. 9 No. 2, pp. 250-265.

Massingham, P. (2014), "An evaluation of knowledge management tools: Part 2 – managing knowledge flows and enablers", *Journal of Knowledge Management*, Vol. 18 No. 6, pp. 1101-1126.

Massis, B. (2018), "Artificial intelligence arrives in the library", *Information and Learning Science*, Vol. 119 Nos 7/8, pp. 456-459.

Mingers, J. (2001), "Combining IS research methods: towards a pluralist methodology", *Information Systems Research*, Vol. 12 No. 3, pp. 240-257.

Moreno, A.G., Lockett, N. and Morales, V.G. (2015), "Exploring the role of knowledge management practices in fostering customer relationship management as a catalyst of marketing innovation", *Baltic Journal of Management*, Vol. 10 No. 4, pp. 393-412.

Orbin, C.J. and Strauss, A. (1990), *A Basics of Qualitative Re- Search: Techniques and Procedures for Developing Grounded Theory*, Sage, London.

Osborn, A. (1953), *Applied Imagination: Principles and Procedures of Creative Problem Solving*, Charles Scribner's Sons, New York, NY.

Payne, A. (2006), *Handbook of CRM: Achieving Excellence in Customer Management*, Butterworth-Heinemann, Burlington.

Payne, A. and Frow, P. (2005), "A strategic framework for customer relationship management", *Journal of Marketing*, Vol. 69 No. 4, pp. 167-176.

Pirkkalainen, H. and Pawlowski, J.M. (2014), "Global social knowledge management – understanding barriers for global workers utilizing social software", *Computers in Human Behavior*, Vol. 30, pp. 637-647.

Ranjan, J. and Bhatnagar, V. (2011), "Role of knowledge management and analytical CRM in business: data mining based framework", *The Learning Organization*, Vol. 18 No. 2, pp. 131-148.

Rowe, G. and Wright, G. (1999), "The Delphi technique as a forecasting tool: issues and analysis", *International Journal of Forecasting*, Vol. 15 No. 4, pp. 353-375.

Sage, A.P. (1977), *Interpretive Structural Modelling: Methodology for Large Scale Systems*, McGraw-Hill, New York, NY.

Shadbolt, N., O'Hara, K., Berners-Lee, T., Gibbins, N., Glaser, H., Hall, W. and Schraefel, M. (2012), "Linked open government data: lessons from data.gov.UK", *IEEE Intelligent Systems*, Vol. 27 No. 3, pp. 16-24.

Silva, M. (2019), "The relationship between organizational commitment, knowledge transfer and knowledge management maturity", *Journal of Knowledge Management*, Vol. 23 No. 3, pp. 489-507.

Singh, R.K., Garg, S.K. and Deshmukh, S.G. (2007), "Interpretive structural modelling of factors for improving competitiveness of SMEs", *International Journal of Productivity and Quality Management*, Vol. 2 No. 4, pp. 423-440.

Skulmoski, G., Hartman, F. and Krahn, J. (2007), "The Delphi method for graduate research", *Journal of Information Technology Education: Research*, Vol. 6 No. 1, pp. 1-21.

Stone, M., Aravopoulou, E., Gerardi, G., Todeva, E., Weinzierl, L., Laughlin, P. and Stott, R. (2017), "How platforms are transforming customer information management", *The Bottom Line*, Vol. 30 No. 3, pp. 216-235.

Susha, I., Grönlund, Å. and Janssen, M. (2015). "Organizational measures to stimulate user engagement with open data", *Transforming Government: People, Process and Policy*, Vol. 9 No. 2, pp. 181-206.

Taleb, N.N. (2011), "A Map and simple Heuristic to detect fragility, antifragility, and model error", NYU-Poly Paper, SSRN, New York, NY.

Tan, C.N.L. and Noor, S.Md. (2013), "Knowledge management enablers, knowledge sharing and research collaboration: a study of knowledge management at research universities in Malaysia", *Asian Journal of Technology Innovation*, Vol. 21 No. 2, pp. 251-276.

Venturini, W.T. and Benito, O.G. (2015), "CRM software success: a proposed performance measurement scale", *Journal of Knowledge Management*, Vol. 19 No. 4, pp. 856-875.

Warfield, J.N. (1974), "Toward interpretation of complex structural models", *IEEE Transactions on Systems, Man, and Cybernetics*, Vol. 4 No. 5, pp. 405-417.

Yoo, S.J., Han, S. and Huang, W. (2012), "The roles of intrinsic motivators and extrinsic motivators in promoting e-learning in the workplace: a case from South Korea", *Computers in Human Behavior*, Vol. 28 No. 3, pp. 942-950.

Yu, T.K., Lu, L.C. and Liu, T.F. (2010), "Exploring factors that influence knowledge sharing behavior via weblogs", *Computers in Human Behavior*, Vol. 26 No. 1, pp. 32-41.

Zack, M., McKeen, J. and Singh, S. (2009), "Knowledge management and organizational performance: an exploratory analysis", *Journal of Knowledge Management*, Vol. 13 No. 6, pp. 392-409.

Zuiderwijk, A., Helbig, N., Gil-García, R. and Janssen, M. (2014), "A review of the state-of-theart and an emerging research agenda: guest editors' introduction", *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 9 No. 2, pp. 1-13.

Appendix ISM Iterations Process

	Reachability set	Antecedent set	Intersection set	Level
Factors (Iteration-1)				
1	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	1	1	
2	2,4,5,7,8,9,11,13,15,16	1,2	2	
3	3,5,6,9,10,11,12,13,14,15,16	1,3	3	
4	4,7,8,9,11,13,15,16	1,2,4	4	
5	5,9,11,13,15,16	1,2,3,5	5	
6	6,10,12,13,14,15,16	1,3,6	6	
7	7,8,11,13,15,16	1,2,4,7,8	7,8	
8	7,8,11,13,15,16	1,2,4,7,8	7,8	
9	9,11,13,15,16	1,2,3,4,5,9	9	
10	10,12,13,14,15,16	1,3,6,10	10	
11	11,13,15,16	1,2,3,4,5,7,8,9,11	11	
12	12,13,14,15,16	1,3,6,10,12	12	
13	13,15,16	1,2,3,4,5,6,7,8,9,10,11,12,13,14	13	
14	14,15,16	1,3,6,10,12,14	14	
15	15,16	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	15	
16	16	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	16	1
Factors Iteration-2				
1	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	1	1	
2	2,4,5,7,8,9,11,13,15	1,2	2	
3	3,5,6,9,10,11,12,13,14,15	1,3	3	
4	4,7,8,9,11,13,15	1,2,4	4	
5	5,9,11,13,15	1,2,3,5	5	
6	6,10,12,13,14,15	1,3,6	6	
7	7,8,11,13,15	1,2,4,7,8	7,8	
8	7,8,11,13,15	1,2,4,7,8	7,8	
9	9,11,13,15	1,2,3,4,5,9	9	
10	10,12,13,14,15	1,3,6,10	10	
11	11,13,15	1,2,3,4,5,7,8,9,11	11	
12	12,13,14,15	1,3,6,10,12	12	
13	13,15	1,2,3,4,5,6,7,8,9,10,11,12,13,14	13	
14	14,15	1,3,6,10,12,14	14	
15	15	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	15	2
Factors Iteration-3				
1	1,2,3,4,5,6,7,8,9,10,11,12,13,14	1	1	
2	2,4,5,7,8,9,11,13	1,2	2	
3	3,5,6,9,10,11,12,13,14	1,3	3	
4	4,7,8,9,11,13	1,2,4	4	
5	5,9,11,13	1,2,3,5	5	
6	6,10,12,13,14	1,3,6	6	
7	7,8,11,13	1,2,4,7,8	7,8	
8	7,8,11,13	1,2,4,7,8	7,8	
9	9,11,13	1,2,3,4,5,9	9	
10	10,12,13,14	1,3,6,10	10	
11	11,13	1,2,3,4,5,7,8,9,11	11	
12	12,13,14	1,3,6,10,12	12	
13	13	1,2,3,4,5,6,7,8,9,10,11,12,13,14	13	3
14	14	1,3,6,10,12,14	14	3

(*continued*)

	Reachability set	Antecedent set	Intersection set	Level
Factors Iteration-4				
1	1,2,3,4,5,6,7,8,9,10,11,12	1	1	
2	2,4,5,7,8,9,11	1,2	2	
3	3,5,6,9,10,11,12	1,3	3	
4	4,7,8,9,11	1,2,4	4	
5	5,9,11	1,2,3,5	5	
6	6,10,12	1,3,6	6	
7	7,8,11	1,2,4,7,8	7,8	
8	7,8,11	1,2,4,7,8	7,8	
9	9,11	1,2,3,4,5,9	9	
10	10,12	1,3,6,10	10	
11	11	1,2,3,4,5,7,8,9,11	11	4
12	12	1,3,6,10,12	12	4
Factors Iteration-5				
1	1,2,3,4,5,6,7,8,9,10	1	1	
2	2,4,5,7,8,9	1,2	2	
3	3,5,6,9,10	1,3	3	
4	4,7,8,9	1,2,4	4	
5	5,9	1,2,3,5	5	
6	6,10	1,3,6	6	
7	7,8	1,2,4,7,8	7,8	5
8	7,8	1,2,4,7,8	7,8	5
9	9	1,2,3,4,5,9	9	5
10	10	1,3,6,10	10	5
Factors Iteration-6				
1	1,2,3,4,5,6	1	1	
2	2,4,5	1,2	2	
3	3,5,6	1,3	3	
4	4	1,2,4	4	6
5	5	1,2,3,5	5	6
6	6	1,3,6	6	6
Factors Iteration-7				
1	1,2,3	1	1	
2	2	1,2	2	7
3	3	1,3	3	7
Factors Iteration-8				
1	1	1	1	8

About the authors

Dr. Sheshadri Chatterjee is a post-doctoral research scholar at Indian Institute of Technology Kharagpur, India. He has completed PhD from Indian Institute of Technology Delhi, India. He is having work experience in different multinational organizations such as Microsoft Corporation, Hewlett Packard Company, IBM and so on. Sheshadri has published research articles in several reputed journals such as Government Information Quarterly, Information Technology & People, Journal of Digital Policy, Regulation and Governance and so on. Sheshadri is also a certified project management professional, PMP from Project Management Institute (PMI), USA and completed PRINCE2, OGC, UK and ITIL v3 UK. Sheshadri Chatterjee is the corresponding author and can be contacted at: sheshadri.academic@gmail.com

Dr. Soumya Kanti Ghosh received the M.Tech and PhD degrees from the Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, India. He was with the Indian Space Research Organization. He is currently a Professor with the Department of Computer Science and

Engineering, IIT Kharagpur. He has authored or coauthored more than 200 research papers in reputed journals and conference proceedings. His current research interests include spatial data science, spatial web services and cloud computing. He is a member of IEEE and ACM.

Dr Ranjan Chaudhuri is an Associate Professor in marketing at National Institute of Industrial Engineering, Mumbai. He was a Fulbright Fellow to USA in 2012. Dr. Chaudhuri also served as an Associate Professor at Vinod Gupta School of Management, Indian Institute of Technology, Kharagpur and at the Department of Management Studies, Indian Institute of Technology Delhi. Dr Chaudhuri has over eighteen years of industrial, teaching and research experience. Dr Chaudhuri's teaching and research interests are in the areas of business to business marketing, global marketing and retail management.